

***Adiantum camptorachis* (Pteridaceae), a New Species from South America with Notes on the Taxonomy of Related Species from the Southern Cone and Bolivia**

MICHAEL A. SUNDUE

The New York Botanical Garden, 200th St. and Southern Blvd., Bronx, NY 10458-5126, U.S.A.

JEFFERSON PRADO

Instituto de Botânica, Caixa Postal 3005, 01031-970, São Paulo, SP, Brazil

ALAN R. SMITH

University Herbarium, 1001 Valley Life Sciences Bldg., University of California, Berkeley, CA 94720, U.S.A.

ABSTRACT.—We describe *Adiantum camptorachis* from the Tucumano-Boliviano forests of southern Bolivia and northwestern and central Argentina. This species was previously confused with *A. glanduliferum*, which is found on the Pacific side of Andes from southern Peru to central Chile. *Adiantum camptorachis* differs by having rhizome scales with distally ciliate margins, erose pinna margins, and by having a flexuous rachis. We also provide a detailed description for *A. rufopunctatum*, which had previously been treated as a synonym of *A. raddianum* by several authors. A key to similar South American species is presented. It includes all species with decompose non-conform laminae and orbicular to reniform or lunate sori in the Southern Cone, including Argentina Chile, Bolivia, Brazil, Paraguay, and Uruguay.

KEY WORDS.—*Adiantum*, taxonomy, new species

Taxonomic and nomenclatural confusion has surrounded species of maidenhair ferns (*Adiantum*) with decompose, non-conform laminae and orbicular to reniform indusia. In the central and southern Andean regions, our recent focus, this confusion largely concerns three species, *Adiantum chilense* Kaulf., *A. poiretii* Wikstr., and *A. raddianum* C. Presl. Problems noted by previous authors include the morphological distinction between *A. chilense* and *A. poiretii* (de la Sota, 1977; Tryon and Stolze, 1989), and the correct name for the latter (Pichi-Sermolli, 1957; Tryon and Stolze, 1989). Our research (Sundue, 2011; Prado, unpublished data) suggests that all three names have often been too broadly applied to also include narrowly restricted taxa in the region (Tryon, 1964; de la Sota, 1977; Tryon and Stolze, 1989; Rodríguez, 1995; Giudice, 1999). Our current contribution, which grew out of recent efforts to resolve the taxonomy and nomenclature of Bolivian species, serves to redefine each of these taxa by the description of one new species, the resurrection of one old species, and by providing a key to identification of similar species in the Southern Cone of South America, an area which we treat here to include Argentina, Chile, Bolivia, Brazil, Paraguay, and Uruguay.

Although the relationships among the non-conform species of *Adiantum* with rounded or fan-shaped ultimate segments are still unclear, they do not all fall within the same clade (Huiet and Smith, 2004; Huiet *et al.*, in prep.), on the

basis of coding and non-coding chloroplast markers (*rbcL*, *rps4*, *rps4-trnS* spacer). Many species in the Southern Cone, including *A. raddianum*, *A. poiretii*, *A. lorentzii* Hieron., and *A. digitatum* Hook., as well as most others still unsampled for molecular markers in the key below, appear to belong to what is here called the *raddianum* clade, comprising mostly Neotropical (especially South American, a few African and Australasian) species that lack silica bodies between the veins (silica bodies are often referred to as “idioblasts” in fern taxonomy, e.g., Wagner, 1978; but see Sundue, 2009), have veins running to sinuses, non-abscising segments, and color of the segment stalks passing into the base of the segments. However, *Adiantum capillus-veneris* L., with veins running to the tips of teeth, belongs to a different, only distantly related clade. The circumscription of the *A. raddianum* clade, as inferred from molecular markers, corresponds only in part to Groups 1 and 2 (*A. capillus-veneris* Group, *A. patens* Group) of Tryon and Tryon (1982: 321–322).

The key provided includes all native species that are commonly confused with *A. chilense*, *A. poiretii*, and *A. raddianum*, or that appear to be closely related. Species included were compiled from Foster (1958), Giudice (1999), Labiak and Prado (2007), Ponce (1996), Ponce *et al.* (2008), Prado (unpublished data), Rodríguez (1995), Sundue (in press), de la Sota (1977), and from the collections at LPB, NY, SP, UC, and USZ. These species have 2–4-pinnate decompose non-conform laminae. Sori in this group range from orbicular to reniform or lunate, but are not linear. Ultimate segments are orbicular, obovate, rhomboid, or flabellate, and do not have silica bodies between the veins. Species with larger, trapeziform, ultimate segments such as *A. mathewsianum* Hook., *A. pentadactylon* Langsd. & Fisch., and *A. trapeziforme* L., are excluded.

Adiantum camptorachis Sundue, J. Prado & A. R. Sm., *sp. nov.* TYPE.—BOLIVIA. Depto. Tarija, Prov. Arce, Municipio Padcaya, Reserva Nacional de Flora y Fauna Tariquía, bajando de la cima del Cerro Lorayoj al Abra del Lorayoj, 21°54'18"S, 64°54'14.1"W, 3200 m, 3 Aug 2005, M. Serrano, J. Villalobos & A. Lliully 6148 (holotype NY!; isotypes HSB, MO!). **Fig. 1, Fig. 2A, B.**

Ex affinitate *A. glandulifero* Link, squamis rhizomatum ciliatis (vs. squamis integerrimis in *A. glandulifero*), segmentis marginibus erosis (vs. segmentis denticulatis in *A. glandulifero*) et rhachibus flexuosis (vs. rhachibus rectis in *A. glandulifero*) differt.

ETYMOLOGY.—Campto-(Greek: *kamptos*, bent) + rachis; referring to the flexuous or zig-zag rachis of the leaf.

Plants terrestrial; rhizomes long-creeping, 1.0–2.5 mm wide, castaneous, forming branch buds, with internodes 1–3 cm long, these sparsely scaly, the nodes and rhizome apices densely scaly, scales 1.5–2.5 × 0.3–1.0 mm, lanceolate, castaneous, shiny, basifixed, the apices acute, margins distally

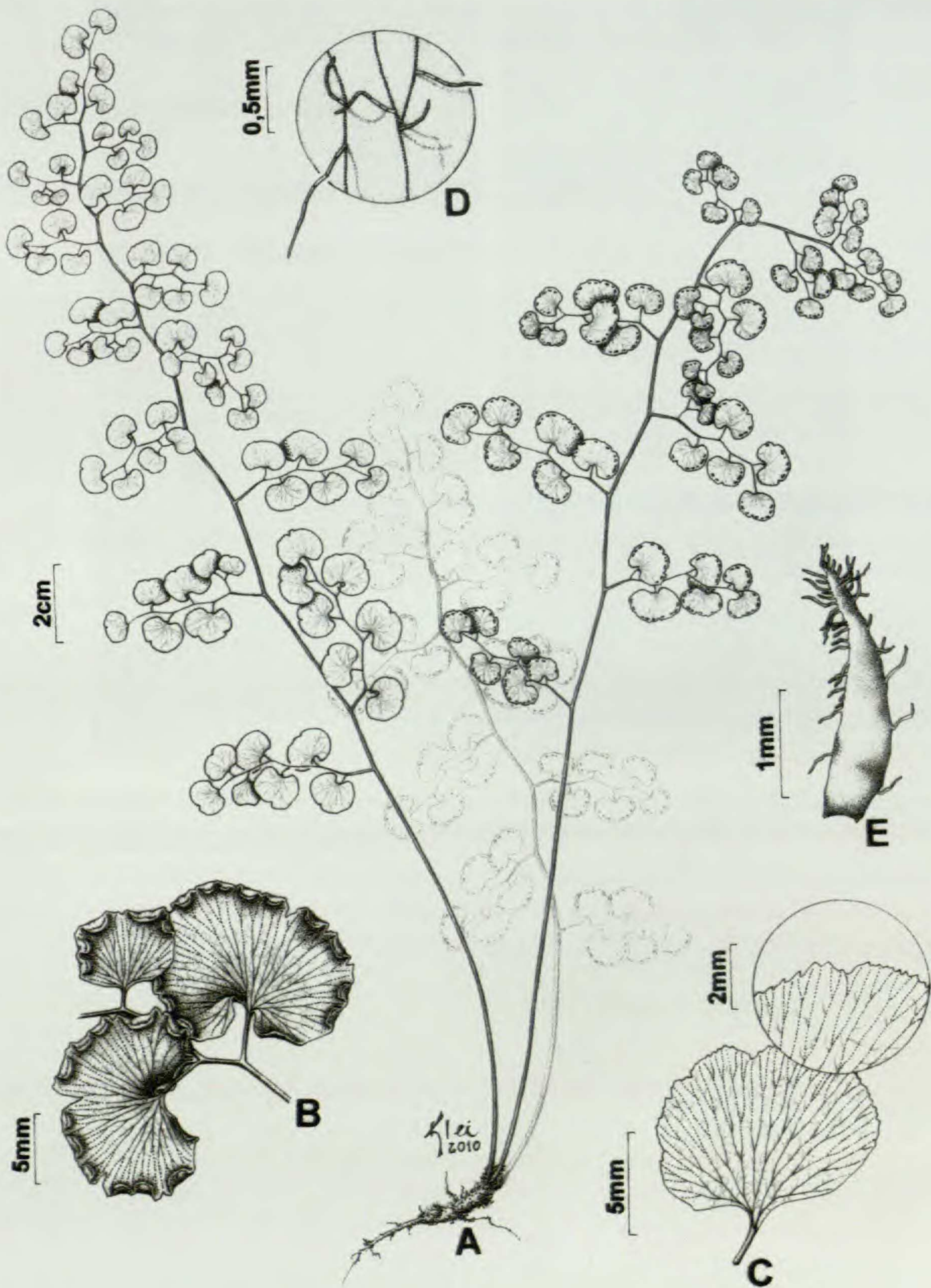


FIG. 1. A–E. *Adiantum camptorachis*. A. Habit. B. Abaxial view of fertile pinnules. C. Abaxial view of the sterile pinnule and a detail of its margin. D. Articulate hairs on pinnule veins abaxially. E. Rhizome scale (A–D, from *Ibisch & Rojas* 325, LPB; E, from *Hennipman & Rödl-Linder* 8093, LPB).

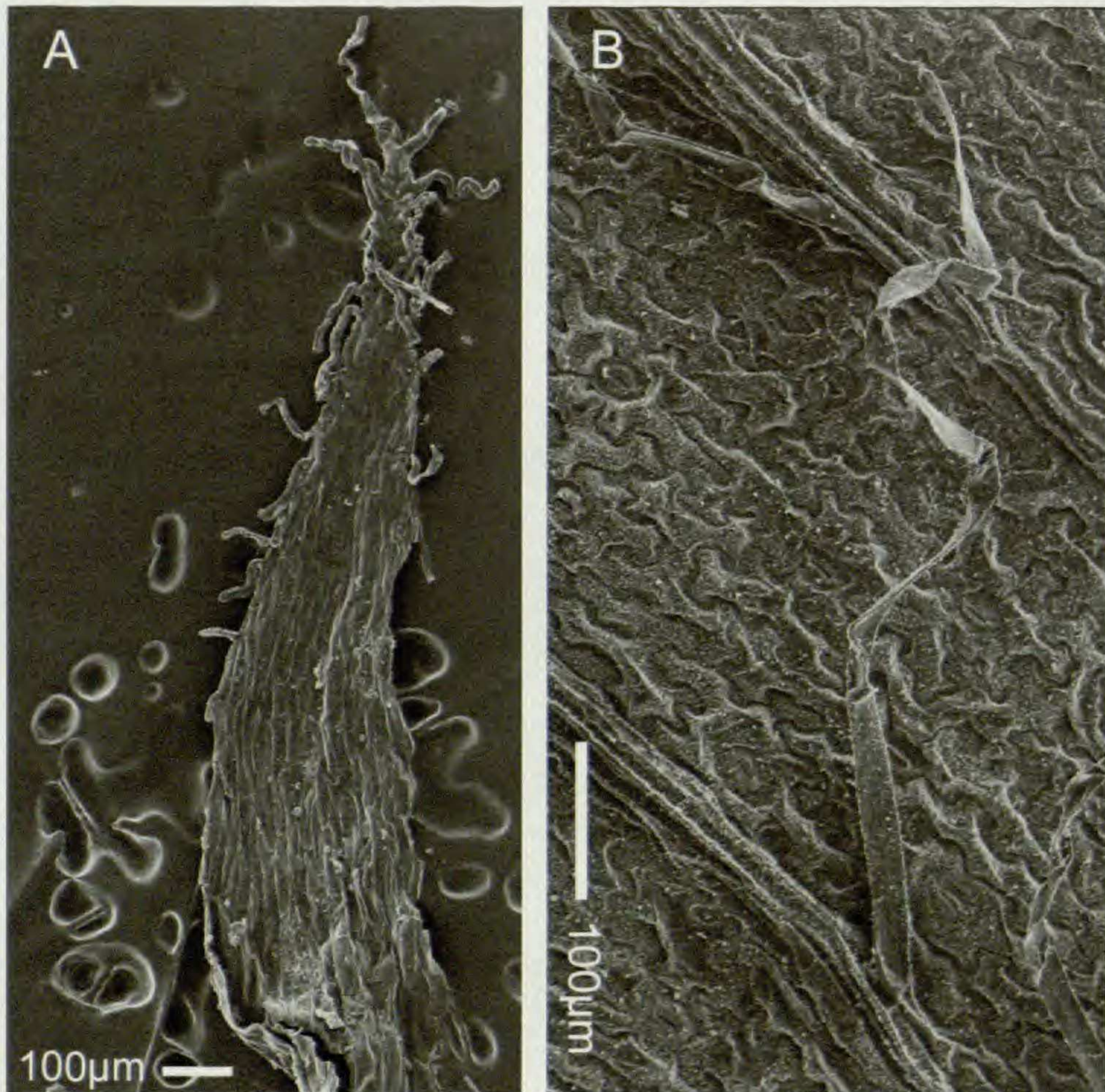


FIG. 2. *Adiantum camptorachis*. A. Rhizome scale. B. detail of a hair on the vein from abaxial laminar surface (both from *Serrano et al.* 6148, NY).

ciliate, the cilia 0.1 mm long, tortuous, spreading, the same color as the body of the scale (Fig. 1E; 2A); leaves 30–75 × 8–20 cm, closely spaced or to 3 cm apart; petioles 10–20 cm × 1–2 mm, castaneous, lustrous, very slightly glaucous or not, glabrous or with a few scales at the base like those of the rhizomes; rachises flexuous, glabrous (Fig. 1A); laminae without apparent silica bodies between veins on both laminar surfaces, oblong to lanceolate, 2–3-pinnate, apices gradually reduced and without a conform terminal pinna, with 7–10 pinna-pairs, the ultimate segments orbicular, petiolulate, with the color of the petiolules passing into the veins at the base of the segments, 0.7–1.5 × 1.5–2.0 cm, the bases truncate to subcordate, the apices shallowly lobed, the margins denticulate and erose (Fig. 1C), the abaxial laminar surfaces slightly glaucous, sparsely villous along the veins, the hairs 0.5–1.0 mm long, 5–8-celled, whitish, slightly tortuous, spreading (Fig. 1D; 2B), the adaxial laminar surfaces glabrous; veins flabellate, ending in sinuses between marginal teeth in sterile segments; sori 1.0–3.0 mm wide, oblong to reniform, whitish, glabrous; spores brown.

OTHER SPECIMENS EXAMINED.—ARGENTINA. Prov. Córdoba: Sierra de Achala, Cuesta del Tránsito, 6–13 Jan 1895, *Kurtz 8353* (NY). BOLIVIA. Depto. Cochabamba: “bei

Cochabamba", 3000 m, 26 March 1892, *Kuntze s.n.* (NY, 2 sheets); Prov. Arque, Comunidad Huancani, 3600 m, 11 Aug 1991, *Ibisch & Rojas 325* (LPB); Prov. Ayopaya, above Independencia, 3400 m, 5 May 1990, *E. Hennipman & Rödl-Linder 8093* (LPB); Prov. Ayopaya, 2 km de Casay Vinto-Choro, 16°32'S, 66°38'W, 3350 m, 3 May 1997, *Kessler et al. 9240* (LPB not seen; UC). Depto. Cochabamba or Depto. Santa Cruz: Sierra de Santa Cruz, 3000 m, May 1892, *Kuntze s.n.* (NY, 2 sheets).

Distribution and habitat.—Restricted to the Tucumano-Boliviano forests of southern Bolivia and northwestern and central Argentina, 3000–3600 m.

Discussion.—*Adiantum camptorachis* was previously confused with *A. glanduliferum* Link, a species sometimes treated as a synonym of *A. chilense* var. *hirsutum* (Hook. & Grev.) R. M. Tryon (see Rodríguez, 1995) and found on the Pacific side of the Andes in southern Peru and northern and central Chile, from pre-cordilleran foothills to 1550 m. Specimens pertaining to *Adiantum camptorachis* were treated as *A. thalictroides* var. *hirsutum* (Hook. & Grev.) de la Sota by de la Sota (1977) in the Flora de la Provincia de Jujuy and with *A. glanduliferum* in synonymy, but this was in error. The two species have similar laminar dissection, segment shape, and abaxial laminar indument of spreading whitish hairs, and judging by these characters alone, the similarity between them is striking. However, *A. glanduliferum* (Fig. 3A, B), and all other Chilean species with decompound laminae, differ by having rhizome scales with entire margins. *Adiantum camptorachis* further differs from these species by having flexuous rachises, and erose segment margins. By comparison, *A. glanduliferum* has a relatively straight rachis, and denticulate segment margins. Rodríguez (1995) reported *A. glanduliferum* as being pubescent on both sides of the lamina, which we have seen in some specimens (Chile, near Valparaíso, 16 Sep 1914, *Rose & Rose 19125*, NY) but not in others (Chile, Bertero *s.n.*, NY; Chile, Valparaíso, 1837, *Gaudichaud s.n.*, NY; Chile, Prov. Valparaíso, Casablanca, Cuesta Lo Orozco, 400–500 m, 4 Nov 1956, *Kausel 4281*, NY), which are pubescent upon the abaxial side of the lamina only. Specimens that are pubescent on both sides of the laminae are also pubescent between the veins and upon the segment margins, whereas in specimens that are pubescent only on the abaxial side of the lamina, the pubescence is restricted to the veins. The significance of these differences should be investigated further.

We also believe that the numerous types cited by de la Sota (1977) for *Adiantum thalictroides* var. *hirsutum*, and by Rodríguez (1995) for *A. chilense* var. *hirsutum*, apply to Chilean species and not to *A. camptorachis*, judging by the provenance of the type collections (Looser, 1940) and by their having rhizome scales with entire margins.

Several other species of *Adiantum* with decompound laminae and orbicular to reniform indusia that occur in northern Argentina and Bolivia could also be confused with *A. camptorachis*, including *A. lorentzii* Hieron., *A. orbignyanum* Kuhn, *A. pseudotinctum* Hieron., *A. raddianum*, and *A. rufopunctatum* Mett. ex Kuhn. However, all of these species differ by rhizome scales with

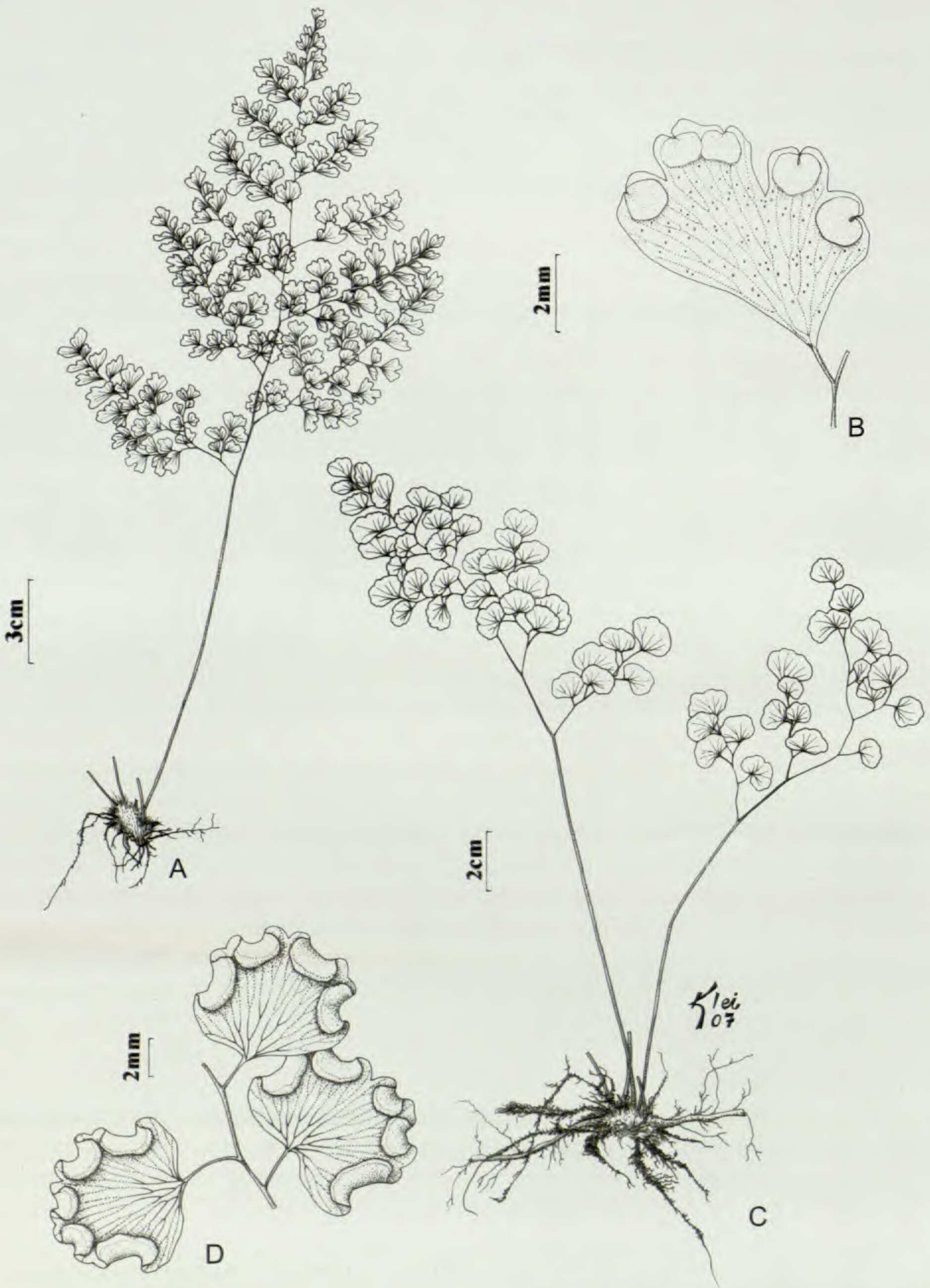


FIG. 3. A–B. *Adiantum rufopunctatum*. A. Habit. B. Abaxial view of fertile pinnule (from Beck 8726, LPB). C–D. *A. poiretii*. C. Habit. D. Abaxial view of fertile pinnules (from Beck & Paniagua 27125, LPB).

entire margins. Furthermore, all of them except *A. orbignyanum* and *A. pseudotinctum* differ by having short-creeping rhizomes.

We suspect that *Adiantum camptorachis* is closely related to *A. poiretii* (Fig. 3C, D), which is distributed from Mexico and the West Indies south to Argentina, Tristan da Cunha, southern Brazil, central and southern Africa, Madagascar, the Mascarenes, and India. Both species share characteristic castaneous rhizome scales with distally ciliate margins, as well as having long-creeping rhizomes. From *A. poiretii*, the new species can be distinguished by its flexuose rachises, erose segment margins, and by the pubescence of the laminae abaxially.

Adiantum poiretii is variable throughout its range, particularly in the degree to which the rhizome scales are ciliate, and whether or not the sori are yellow-farinose. This variation does not include characters that overlap with those of *A. camptorachis*, nonetheless we acknowledge the need for further study of *A. poiretii* throughout its range. Pichi-Sermolli (1957) considered *A. poiretti* to be endemic to Tristan da Cunha, and *A. thalictroides* Willd. ex Schldl. to be the correct name for plants of this complex from elsewhere. Most recent authors, however, have disagreed (R. M. Tryon, 1964; A. F. Tryon, 1966; Tryon and Stolze, 1989; Moran, Zimmer and Jermy, 1995; Rodríguez, 1995; Mickel and Smith, 2004) and applied the name *A. poiretii* broadly. We have not studied the type of this species (*du Petit-Thouars* 1427, P), and believe that more comprehensive studies are needed to resolve the circumscription of the species. Manton and Vida (1968) reported a chromosome number of $n = 114$ for plants of *A. poiretii* from Tristan da Cunha, twice the number counted from continental Africa. Christensen (1940), in his flora of Tristan da Cunha, described plants there as having rhizome scales with entire margins, whereas material from Africa, Madagascar, and the Americas has scales with distally denticulate margins. However, illustrations of rhizome scales of plants from the nearby Gough Island (based on *Hänel s.n.*, NBG, kindly made available to us by Koos Roux) show that those scales are not entire, but in fact sparsely ciliate.

Adiantum rufopunctatum Mett. ex Kuhn, Jahrb. Königl. Bot. Gart. Berlin 1: 350. 1881. TYPE.—BOLIVIA. Yungas, [without precise date], A. C. V. D. d'Orbigny 165 (lectotype B n.v., chosen by R. M. Tryon (1964), BGBM virtual herbarium image Id: 262880 (Röpert, 2000), photo GH, US; isotypes P n.v. MNHN image barcode: P00608520, F! fragment, MO n.v. fragment, NY! fragment). **Figs. 3A–B, 4.**

Adiantum boliviense H. Christ & Rosenst., Repert. Spec. Nov. Regni Veg. 5: 230. 1908. TYPE.—BOLIVIA. Prov. La Paz, Sud Yungas, Yanacachi prope La Florida, 16° S, 1600 m, 21 Nov 1906, O. Buchtien 459 (Lectotype S n.v., designated by R. M. Tryon (1964); isolectotypes P n.v. MNHN image online barcode: P00608521, UC!, US! barcode: 00142178).

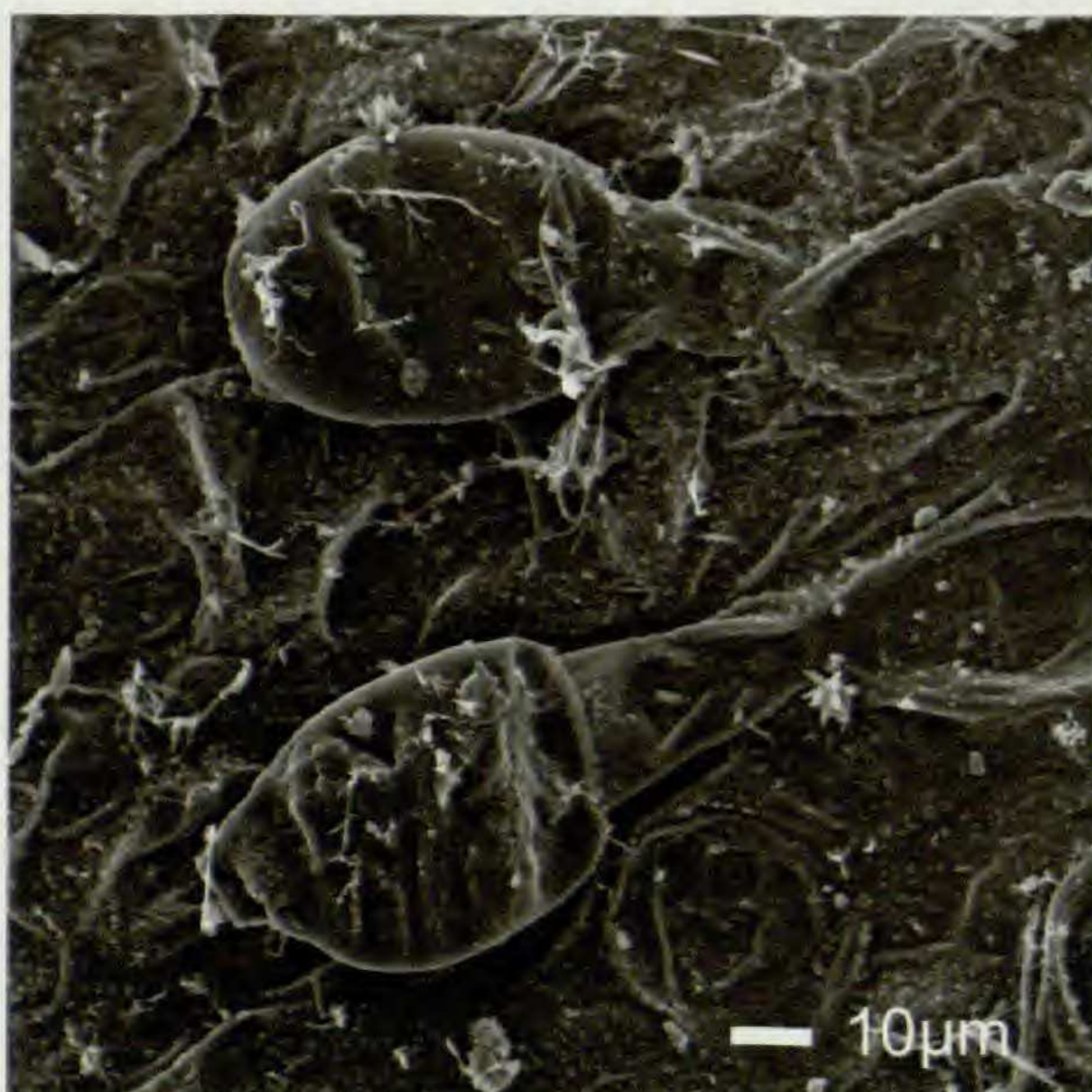


FIG. 4. *Adiantum rufopunctatum*. Detail of a glandular hair 2-celled between veins from abaxial laminar surface (from Bang 2964, NY).

Adiantum decorum var. *quadripinnata* Rosenst., Meded. Rijks-Herb. 19: 8. 1913. TYPE.—BOLIVIA. [Depto. Cochabamba or Depto. Santa Cruz] Yungas de San Mateo, 1500 m, [without precise date], *T. C. J. Herzog* 1995 (Lectotype **here designated** US! barcode: 00142180, isoelectotype S?).

Plants terrestrial; rhizomes short-creeping, ca. 4 mm wide, the rhizome apices densely scaly, the scales $2.0\text{--}3.5 \times 0.3\text{--}0.6$ mm, narrowly lanceolate, light brown to castaneous, shiny, basifixed, the apices long-attenuate, margins entire; leaves $30\text{--}50 \times 15\text{--}20$ cm, caespitose; petioles $10\text{--}20$ cm \times 1–2 mm, castaneous, lustrous, the bases very slightly glaucous, glabrous or with a few scales at the base like those of the rhizomes; rachises essentially straight, not conspicuously flexuous; laminae without apparent silica bodies between veins on both laminar surfaces, ovate to deltate, 3–4-pinnate, with 5–10 pinnae, the apices gradually reduced and without a conform terminal pinna, the ultimate segments orbicular, petiolulate, with the color of the petiolules passing into the veins at the base of the segments, $0.7\text{--}1.5 \times 1.5\text{--}2.0$ cm, the bases cuneate, apices rounded to shallowly lobed, the abaxial laminar surfaces evenly glandular, the glands 2-celled, reddish, ca. 0.04 mm wide (Fig. 3B, 4), otherwise glabrous, the adaxial laminar surfaces glabrous; veins flabellate, ending in sinuses of sterile segments; sori 1.0–3.0 mm wide, orbicular, whitish, glabrous; spores brown.

SELECTED SPECIMENS EXAMINED.—PERU. Depto. Cuzco: Prov. La Convención, approx. 150 km de Cuzco en la vía carretera Cuzco-Quillabamba, $12^{\circ}57'S$, $72^{\circ}40'W$, 1100–1300 m, 14 Nov 1987, *Núñez* 8594 (NY); Prov. La Convención, abajo de Echarate en el Alto Urubamba, $12^{\circ}47'S$, $72^{\circ}40'W$, 670 m, 3 Feb 1989, *Núñez et al.* 10154 (NY); Prov. La Convención, western affluent of Vilcanota, valley of Sambray, 1200 m, 10 May 1936, *Mexia* 8033 (NY, UC); Prov. La

Convención, Dist. Maranura, Santa María, 13°00'17" S, 72°33'02"W, 1207 m, 27 Mar 2004, *Huamantupa & Huamantupa* 4525 (MO n.v., UC); Quillabamba, 1200 m, 21 Feb 1954, *Coronado* 129 (UC). Depto. Junín: Prov. Tarma, near Vitoc, along San Ramón – Monobamba rd. 1190 m, 22 May 1978, *Skog et al.* 5010 (NY); Huacapistana, 1812 m, 30 Oct 1954, *Coronado* 276 (UC). BOLIVIA. Depto. La Paz: Prov. Bautista Saavedra, Area Natural de Menejo Integrado Apolobamba, Camata, puente sobre el Río Chatazani–Camata, 15°13'39"S, 68°45'40"W, 1450 m, 19 Apr 2005, *Miranda et al.* 731 (MO n.v., UC); Prov. Bautista Saavedra, 10 km de Camata hacia Apolo, 15°13'S, 68°41'W, 1300 m, 25 Jun 1997, *Kessler et al.* 10332 (LPB n.v., UC); Prov. Caranavi, camino Caranavi-Palos Blancos, 15°48'S, 67°28'W, 1280 m, 27 Sep 2001, *Jiménez* 658 (LPB n.v., UC); Prov. Franz Tamayo, San Juan, 3800 ft, 1901–1902, *Williams* 1311 (NY, UC); Bolivia: Nor Yungas, Coripata 12 km hacia el S, vía Puente Villa, Quebrada húmeda con arroyo 16°22'S, 67°36'W, 1600 m, 31 Dec 1983, *Beck* 8726 (LPB, SP); Prov. Nor Yungas, Milluguaya, 1300 m, Jul 1917, *Buchtien* 5036 (NY, UC); Prov. Nor Yungas, 2.6 km below Yolosa, 1200 m, 22 Jan 1988, *Grifo & Solomon* 741 (NY, UC); Prov. Nor Yungas, valley of Río Yolosa, near Yolosa, ca. 1500 m, 5 Dec 1935, *Mexia* 7800 (UC); Prov. Nor Yungas, fin del camino del Inca, puente de Huarinilla, 450 m, 27 Mar 1992, *Schmit* 459 (UC); Prov. Sud Yungas, basin of Río Bopi, San Bartolomé, near Calisaya, 750–900 m, 1–22 July 1939, *Krukoff* 10043 (NY); Prov. Sud Yungas, Pitiguaya, valley of Unduavi River, 5800 ft, 7–15 May 1926, *Tate* 762 (NY). Depto. Santa Cruz: Prov. Florida, comunidad de Bella Vista, 18°11'57.75"S, 63°41'21.46"W, 1000–1100 m, 4 Aug 2006, *Villarroel et al.* 517 (NY). Depto. Chuquisaca: Prov. Luis Calvo, bajando de la cima de la Serranía del Ñao, 19°32'28"S, 63°55'03"W, 1820 m, 8 Nov 2001, *Huaylla* 146 (NY). Without precise locality, *Bang* 2064 (NY, UC).

Distribution and habitat.—Humid montane forests from central Peru to southern Bolivia, (670–)1100–1500(–1820) m.

Adiantum rufopunctatum was treated as a synonym of *A. raddianum* C. Presl by Tryon (1964), a species with a much larger range and known from the Antilles, Mexico, Central America, Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil, Paraguay, Uruguay, and Argentina from 200–1800(3000) m. However, *A. rufopunctatum* can be readily distinguished from *A. raddianum* by having reddish glands, 2-celled, ca. 0.04 mm wide on the abaxial laminar surfaces (Figs. 3B, 4).

The lamina architecture of *Adiantum rufopunctatum* will also often contrast strongly with that of *A. raddianum*, but some plants overlap in these characters. *Adiantum rufopunctatum* is characterized by laminae that are 3–4-pinnate. The basal pinnae have well developed basiscopic pinnules, to 4.0 cm long, and all of the pinnae tend to have well developed acroscopic pinnules that are (1.5–)4.0–5.5(–6.5) cm long. The ultimate segments of *A. rufopunctatum* are 3.0–14.0 × 1.5–13.0 mm long, oblanceolate to obovate or flabellate, with cuneate bases, and rounded to lobed apices (Fig. 3B). By contrast, the laminae of *A. raddianum* are 2–3(4)-pinnate, and the pinnae are oblong to lanceolate, bearing acroscopic pinnules that are 1.3–2.8 cm long. The ultimate segments are (4.0–)8.0–19.0 × (3.0–)4.0–18.0(–22.0) mm, and are

oblong to obdeltate, the bases are obtuse, square, or cuneate, and apices are lobed and often incised.

KEY TO THE DECOMPOUND (2–4-PINNATE) NON-CONFORM SPECIES OF *ADIANTUM* IN THE SOUTHERN CONE AND BOLIVIA

1. Ultimate segments deeply lobed, often more than half the length of the segment; fronds subscandent; axes with raised aerophores at each branching point, the aerophores often pale. *A. digitatum*
1. Ultimate segments shallowly lobed, less than half the length of the segment; fronds erect, not subscandent; axes smooth, without aerophores, or the aerophores inconspicuous, not differing in color.
 2. Veins of sterile laminar segments terminating in teeth of the segment margins. *A. capillus-veneris*
 2. Veins of sterile laminar segments terminating at the base of sinuses between teeth of the segment margins, or the margins of sterile segments without teeth and sinuses, essentially entire.
 3. Ultimate segments articulate, the articulations at the apices of the segment petiolules swollen; dark color of the segment petiolules stopping abruptly at the point of articulation and not passing onto the bases of segments. *A. orbignyanum*
 3. Ultimate segments not articulate; apices of segment petiolules not swollen; dark color of segment petiolules changing gradually, often fading before, or passing into the bases of segments.
 4. Sori orbicular to reniform.
 5. Laminae pseudo-pedately divided, often with two \pm equal rachises each bearing 1-pinnate pinnae on one side, sometimes with single central rachis; rachises with branched whitish hairs, ca. 0.1 mm long; rhizome scales golden, the margins ciliate. *A. patens*
 5. Laminae pinnately divided, always with a single central rachis; rachises glabrous; rhizome scales light to dark brown, or castaneous, the margins entire to sparsely denticulate.
 6. Basal pinnae sessile, the proximal ultimate acroscopic segments of basal pinnae suborbicular, usually conspicuously overlapping the rachis; rhizome scales sparsely denticulate. *A. subvolubile*
 6. Basal pinnae stipitate, the proximal ultimate segments of basal pinnae cuneate, usually not overlapping the rachis; rhizome scales entire.
 7. Rhizomes long-creeping. *A. pseudotinctum*
 7. Rhizomes short-creeping to erect.
 8. Sori yellow-farinose; rhizomes erect or suberect *A. lorentzii*
 8. Sori not yellow-farinose; rhizomes short-creeping to suberect.
 9. Rhizome scales stramineous to ferrugineous or light brown, not conspicuously lustrous. *A. sinuosum*
 9. Rhizome scales castaneous, lustrous.
 10. Abaxial laminar surfaces glandular, the glands 2-celled, reddish, 0.04 mm wide; laminae 3–4-pinnate; pinnae broadly lanceolate; acroscopic pinnules (1.5–)4.0–5.5(–6.5) cm long; ultimate segments 3.0–14.0 \times 1.5–13.0 mm *A. rufopunctatum*
 10. Abaxial lamina surfaces without glands; laminae 2–3(4)-pinnate; pinnae oblong to narrowly lanceolate; acroscopic pinnules 1.3–2.8 cm long; ultimate segments (4.0–)8.0–19.0 \times (3.0–)4.0–18.0 (–22.0) mm *A. raddianum*
 4. Sori oblong to lunate.
 11. Rhizome scale margins ciliate throughout, or at least distally.
 12. Abaxial laminar surfaces glabrous; rachises essentially straight, not conspicuously flexuous; sori yellow-farinose or not. *A. poiretii*

12. Abaxial laminar surfaces villous, the hairs 0.5–1.0 mm long, 5–8-celled, whitish, slightly tortuous, spreading; rachises flexuous; sori not yellow-farinose. *A. camptorachis*
11. Rhizome scale margins entire.
 13. Laminar surfaces entirely glabrous, lacking hairs, glands, and farina, or if yellow farina present then confined to the sori.
 14. Axes with septate hairs and narrow hairlike scales, the hairs and scales to 2.0 mm long *A. excisum*
 14. Axes glabrous. *A. chilense*
 13. Laminae pubescent, farinose, or glandular.
 15. Laminae yellow-farinose or with sessile yellow glands ca. 0.1 mm wide; laminae lacking hairs *A. sulphureum*
 15. Laminae non-farinose or white-farinose, sessile glands absent; laminae pubescent.
 16. White farina present at apices of the laminar hairs *A. scabrum*
 16. Farina absent.
 17. Axes and laminae pubescent, the hairs to ca. 1.5 mm long. *A. gertrudis*
 17. Axes glabrous, the laminae pubescent, the hairs less than 1.0 mm long *A. glanduliferum*

ACKNOWLEDGMENTS

The first author's research is funded by a grant to Robbin Moran from the United States National Science Foundation (DEB 0717056). The second author thanks Michael Kessler for the invitation to work on the Bolivia Flora Project. We also thank Koos Roux for providing photos and illustrations of *Adiantum poiretii* from Gough Island, Michael Nee for providing details on Otto Kuntze's itinerary in Bolivia, and Layne Huiet and Monica Ponce for helpful comments on the manuscript. The illustrations were prepared by Klei Souza.

LITERATURE CITED

CHRISTENSEN, C. 1940. The pteridophytes of Tristan da Cunha. Res. Norw. Sci. Exped. Tristan da Cunha 1937–1938. 6:1–25.

DE LA SOTA, E. R. 1977. Pteridophyta. In: A. Cabrera, ed. Flora de la Provincia de Jujuy, República Argentina. Colección Científica del INTA, XIII, Parte II. Buenos Aires.

FOSTER, R. C. 1958. A catalog of the ferns and flowering plants of Bolivia. Contr. Gray Herb. 184:1–223.

GIUDICE, G. 1999. Sinopsis de las especies Argentinas del género *Adiantum* (Pteridaceae, Pteridophyta). Darwiniana 37:279–300.

HUIET, L. and A. R. SMITH. 2004. Phylogenetic relationships in *Adiantum* inferred from chloroplast coding and non-coding sequences. Botany 2004, Abstracts. Snowbird, Utah, August 2004.

LABIAK, P. H. and J. PRADO. 2007. New records of pteridophytes from Bolivia and Brazil. Amer. Fern J. 97:113–123.

LOOSER, G. 1940. Las localidades de los tipos de los helechos chilenos. Revista Univ. (Santiago) 25:155–204.

MANTON, I. and G. VIDA. 1968. Cytology of the fern flora of Tristan da Cunha. Proc. Roy. Soc. London. Ser. B. Biol. Sci. 170:361–379.

MORAN, R. C., B. ZIMMER and A. C. JERMY. 1995. *Adiantum*. In: Moran, R. C. and R. Riba, (eds.). Flora Mesoamericana Volumen 1. Psilotaceae a Salviniaceae. Universidad Nacional Autónoma de México Instituto de Biología. Ciudad Universitaria. México, D.F.

PICHI-SERMOLLI, R. E. G. 1957. Adumbratio Flora Aethiopicae 5. Parkeriaceae, Adiantaceae, Vittariaceae. *Webbia* 12:693–695.

- PONCE, M. M. 1996. Pteridophyta. In: Catálogo de las Plantas Vasculares de la República Argentina. I. Monogr. Syst. Bot. Missouri Bot. Gard. 60:1–79.
- PONCE, M. M., J. PRADO and G. GIUDICE. 2008. Pteridaceae. Pp. 115–136. In: Zuloaga, F. O., O. Morrone and M. J. Belgrano, (eds.). Catálogo de las Plantas Vasculares de Cono Sur. Monogr. Syst. Bot. Missouri Bot. Gard. 107:1–161.
- RODRÍGUEZ, R. R. 1995. Pteridophyta. In: C. Marticorena and R. R. Rodríguez, (eds.). *Flora de Chile. Vol. 1. Pteridophyta–Gymnospermae*. Universidad de Concepción, Concepción.
- Röpert, D. (Ed.) 2000. (continuously updated): Digital specimen images at the Herbarium Berolinense. Published on the Internet <http://ww2.bgbm.org/herbarium/> (Barcode: B 20 0007084/ImageId: 262880) [accessed 28-Feb-10].
- SMITH, A. R., M. KESSLER and J. GONZALES. 1999. New records of pteridophytes from Bolivia. *Amer. Fern J.* 89:244–266.
- SUNDUE, M. A. 2009. Silica bodies and their systematic implications in Pteridaceae (Pteridophyta). *Bot. J. Linn. Soc.* 161:422–435.
- SUNDUE, M. A. 2011. Helechos y Licofitas. In: M. H. Nee, ed. *Flora de la Región del Parque Nacional Amboró*, Vol. 1. Editorial FAN, Santa Cruz de la Sierra.
- TRYON, A. F. 1966. Origin of the fern flora of Tristan da Cunha. *Brit. Fern Gaz.* 9:269–276.
- TRYON, R. M. 1964. The ferns of Peru. Polypodiaceae (Dennstaedtieae to Oleandreae). *Contr. Gray Herb.* 194:1–253.
- TRYON, R. M. and R. G. STOLZE. 1989. Pteridophyta of Peru, part II, 13. Pteridaceae–15. Dennstaedtiaceae. *Fieldiana, Bot.* 22:1–128.
- TRYON, R. M. and A. F. TRYON. 1982. *Ferns and Allied Plants, with Special Reference to Tropical America*. Springer-Verlag, New York.
- WAGNER, W. H. 1978. Venuloid idioblasts in *Pteris* and their systematic implications. *Acta Phytotax. Geobot.* 29:33–40.